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Preliminary Checklist of Fish Species of Sungai Rengai, Kuala Lipis, Pahang, Malaysia

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ABSTRACT. This study contributes preliminary data on the fish checklist of Sungai Rengai, Kuala Lipis, Pahang and the fish status reported by IUCN. Sungai Rengai is located southeast of Penjom Goldmine, Kuala Lipis. Specimens were collected using an electro-fisher aided with scoop nets and cast nets. Fish specimens were sorted, identified, measured, and released. Altogether, 48 individuals caught belonged to six families and nine species, with Cyprinidae as the dominant family and *Osteochilus vittatus* as the most abundant species (14 individuals). The freshwater fish status in Sungai Rengai by referring to the IUCN Red List of Threatened Species was also documented. All species sampled from Sungai Rengai are listed under Least Concern (LC) except *Anguilla bicolor*, which is Near Threatened (NT). More intensive studies are recommended in the future by covering a wider river area. Biotic and abiotic factors such as water quality, allometric growth pattern and physical water parameters related to the species composition are also suggested to understand the fish diversity of Sungai Rengai further.

Keywords: Freshwater fish, Checklist, Kuala Lipis, Pahang

INTRODUCTION

The freshwater area in Malaysia is estimated to be 549 000km^2 in size and ranges from streams to estuarine (Ahmad et al., 2018). Freshwater species are much more in danger than terrestrial species, although freshwater makes up less than 1% of the earth's area (Radinger et al. 2019). Like terrestrial species, the threats also come from anthropogenic activities such as deforestation. Thus, this calls for more studies and conservation activities since the freshwater are home to fish and other catches that provide nutrients for most people, especially the communities living nearby rivers. Freshwater fishes also play a huge role in ecology, especially as bioindicators of freshwater health and their community, as they have various responses to the destruction of freshwater habitat, making them important for conservation purposes.

In Peninsular Malaysia, small stream such as Sungai Rengai is not commonly known; thus, the data about the fish distribution is still scarce. The health status and information regarding Sungai Rengai in Kuala Lipis, Pahang are also insufficient resulting in low identification of its characteristics. However, a part of streams in Kuala Lipis has been explored as reported by Hasan et al. (2021), who mentioned the first record of longnose marbled whipray -

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Fluvitrygon oxyrhyncha (Sauvage, 1878) in Kuala Lipis District. Even though the tools and equipment available nowadays are more advanced, the rate of discovering species is still relatively slow, mainly because of the inability to access the study sites (Ahmad et al., 2018).

The study of fish diversity, such as in Sungai Rengai, is important because it provides a perspective on the freshwater community in the area. For example, a survey on water quality influences on fish occurrences conducted by Abdul-Rashid et al. (2018) in Sungai Pahang of Maran District, Pahang, reported three species that are categorised as Endangered (EN), including *Balantiocheilos melanopterus*, *Probarbus jullieni*, and *Pangasianodon hypophthalmus* according to The International Unions for Conservations of Nature (IUCN) Red List of Threatened Species. Therefore, continuous reports on the status of freshwater fishes are significant to encourage conservation efforts of the freshwater habitats and the lives beneath them. The objectives of this study are to document fish species checklist distribution in Sungai Rengai and to determine the status of freshwater fishes in Sungai Rengai, Kuala Lipis Pahang, according to the IUCN Red List of Threatened Species.

METHODOLOGY

Study Site

Sungai Rengai is located in Kuala Lipis, Pahang, southeast of Penjom Goldmine. The stream is branched from Sungai Lipis (4°05'39.2 "N 102°00'27.2 "E) and ended at 4°04'59.7"N 102°01'55.4"E, which is separated from Sungai Talun as shown in Figure 1 below. The stream travels through Kampung Rengai-Kadok, Kampung Kemahang, and Kampung Rengai. In addition, the streams are connected to Sungai Jelai, which splits with Sungai Tembeling and intersects at Kuala Tembeling, Jerantut (Sukeri et al., 2020). Three river stations were selected, characterised by shallow water with narrow width and slow to moderate moving water current, while the bottom substrates comprised gravels, pebbles, and coarse to fine sand. The area was surrounded by secondary dipterocarp forests.

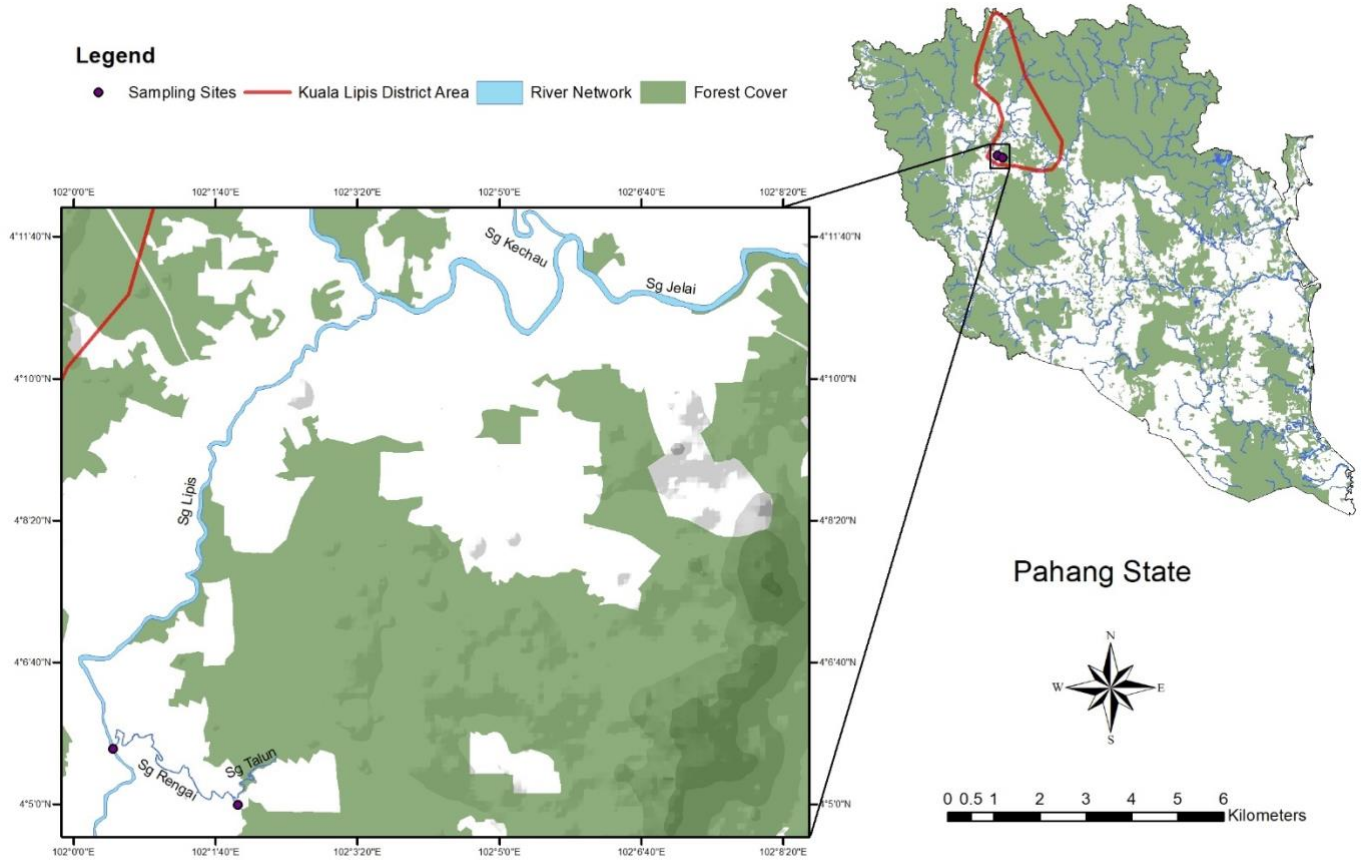

Figure 1. The map of the study site

Collection of fish specimens

The sampling was conducted in July 2019 using a handheld electro-fisher (Smith-Root Inc; Model LR-20) that fit into a backpack. The distance of sampling was set at 100m - 150m by moving upstream. The voltage was adjusted from around 100V to 400V in accordance with the conductivity of the water to ensure that the voltage output would be sufficient to shock the sample without causing any harm (Ahmad et al., 2020). After that, a scoop net was used to catch the fish that had been stunted. Cast nets were employed to collect fish in waters that did not lend themselves well to electro-fishing equipment. To protect the smaller fishes from being eaten by larger predatory species, the fish samples were put separately in different uncapped specimen bottles according to their groups and sizes (Ahmad et al., 2014).

Fish Identification

Fish samples were identified immediately after being captured and then released. Species of fish were classified according to their morphological characteristics, such as the body shape, the location and colour of fins, and the presence of snout, following Kottelat and Whitten (1996), Rainboth (1996), and Froese and Pauly (2021a). The external morphology of a single species would exhibit various details such as external morphologies, behaviour, and

status (Sukeri et al., 2020). Each species was photographed by using a digital camera. Next, scientific names were determined because they are more precise than local names, which can vary by region. The number of individuals for each species was also counted. In addition, the status of each species was also checked and recorded by referring to the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species.

Fish measurement

The total length (TL – measured from the tip of the snout to the tip of the tail) and standard length (SL – measured from the tip of the snout to the posterior end of the last vertebra) of the fish specimens were measured precisely up to 0.1 cm by using a measuring tape or ruler board. For the weight of each individual, an electronic digital balance was used and measured precisely until 0.1g.

RESULTS AND DISCUSSION

A total of 48 individuals (nine species, six families) are recorded at Sungai Rengai, with *Osteochilus vittatus* of Cyprinidae dominating (14 individuals – 29%), followed by *Neolissochilus soroides* (10 individuals – 21%), *Mystacoleucus obtusirostris* (eight individuals – 17%), *Oxyeleotris marmorata* (5 individuals - 10%), *Mastacembelus armatus* (five individuals – 10%), and *Hemibagrus gracilis* (three individuals – 7%). *Anguilla bicolor*, *Barbonymus schwanefeldii*, and *Pristolepis grootii* represent only a single individual, respectively. The stream can be seen as dominated by the Cyprinidae family with four species, while Anguillidae, Bagridae, Eleotridae, Mastacembelidae and Pristolepididae families record only a single species for each family. Table 1 shows a list of families, species, local names, and IUCN status for each fish species, while Figure 2 (A-I) shows fish species of Sungai Rengai.

Table 1. Table of family, species list, local names, and IUCN status of fish

Family	Species	Local Name	IUCN Status
Anguillidae	*Anguilla bicolor*	Belut dwiwarna	NT
Bagridae	*Hemibagrus gracilis*	Baung akar	LC
Cyprinidae	*Barbonymus schwanefeldii*	Lampam sungai	LC
	Mystacoleucus obtusirostris	Sia	LC
	Neolissochilus soroides	Tengas	LC
	Osteochilus vittatus	Terbul	LC
Eleotridae	*Oxyeleotris marmorata*	Ketutu	LC
Mastacembelidae	*Mastacembelus armatus*	Tilan trek tayar	LC
Pristolepididae	*Pristolepis grootii*	Kepar	LC

NT = Near Threatened; LC = Least Concern

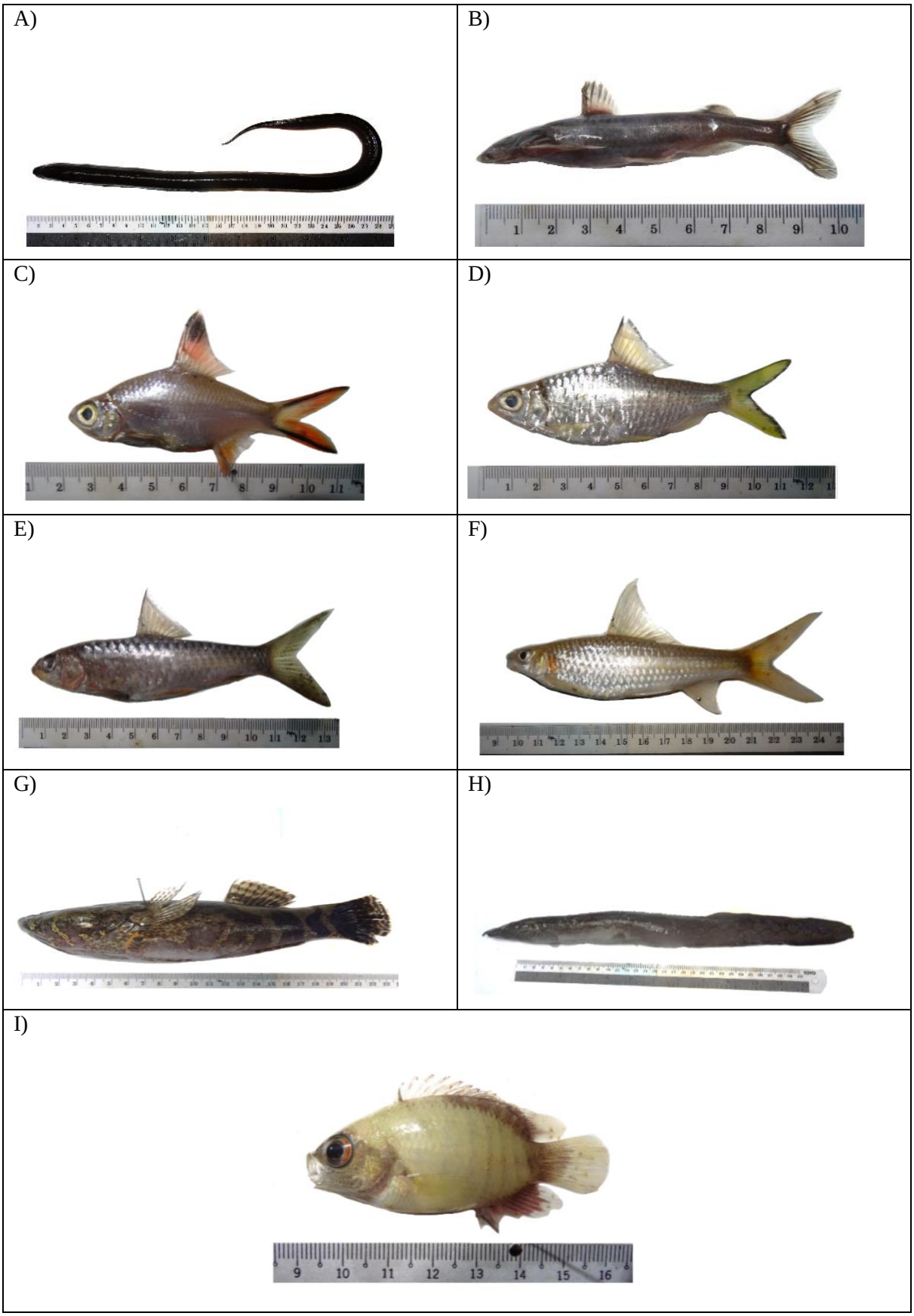

Figure 2. (A-I): Fish species of Sungai Rengai; A) *Anguilla bicolor*; B) *Hemibagrus gracilis*; C) *Barbonymus schwanefeldii*; D) *Mystacoleucus obtusirostris*; E) *Neolissochilus soroides*; F) *Osteochilus vittatus*; G) *Oxyeleotris marmorata*; H) *Mastacembelus armatus*; and I) *Pristolepis grootii*

Systematic

Family: Anguillidae

1. *Anguilla bicolor* (McClelland,1844)

Common name: Indonesian shortfin eel ("Belut dwiwarna")
TL: 397 mm (N = 1)
Notes: The dorsal sides are olive to dark blue-brown, while the ventral sides are lighter in colour. Visible yellow to orange nostrils are believed to help lure prey (Tweddle & Skelton, 2016). Their habitat preferences in freshwater span from upstream to downstream (Arai & Abdul-Kadir, 2017). Catadromous; the species breed in the water when they reach maturity (Arai & Chino, 2011; Hamzah et al., 2015). In Malaysia, the species is found in estuarine areas, which occasionally migrate around 60 km from the ocean into freshwater rivers (Arai et al., 2012). Distributions were recorded such as in Sungai Kurau, Bukit Merah, Perak (Arai et al., 2012), Sungai Pinang, Penang Island (Arai et al., 2012), Balik Pulau, Penang (Nasruddin et al., 2014), and Langkawi Island, Kedah (Arai & Wong, 2016).
Distribution: Indian Ocean, Western Pacific Ocean around Indonesia and Malaysia. Arai et al. (2012) p. 692-697
Species utilisation: Food fish.

Family: Bagridae

2. *Hemibagrus gracilis* (Ng & Ng, 1995)

Common name: Riverine catfish ("Baung akar")
TL: 51 to 60 mm (N = 3)
Notes: The body is light grey to grey with a yellowish-cream lateral line. Characterised by a flat head, long snout, medium large eyes, long barbels and a very slender body. Inhabits body water with clear and fast currents with rocks and sands as their substrate (Ng & Ng, 1995). **Distribution:** Peninsular Malaysia. Ng and Ng (1995) p. 133-142.
Species utilisation: Food fish.

Family: Cyprinidae

3. *Barbonymus schwanefeldii* (Bleeker, 1854)

Common name: Tinfoil barb ("Lampam sungai")
TL: 85 mm (N = 1)
Notes: Formerly known as *Puntius schwanefeldii* and *Barbodes schwanefeldii* (Kamarudin & Esa 2009). Yellowish silver body with a flat and wide body shape (Desrita et al., 2021). Red dorsal, pectoral and anal fins with black patches are the most noticeable trait at the dorsal tips. The caudal fin is orange, with two black lines across the caudal fin lobe. Potamodramous; can be found in upper water bodies for spawning, and habitats range from middle to lower

water bodies (Isa & Md-Shah, 2012; Sabarudin et al., 2017). It can reach 25 cm in size (Isa & Md-Shah, 2012), is highly sought by the locals and is bred for aquaculture purposes (Karim et al., 2021).

Distribution: Throughout countries of Asia such as Thailand, Vietnam, Indonesia, Brunei and Malaysia. Sabarudin et al., (2017).

Species utilisation: Food and aquarium fish.

4. *Mystacoleucus obtusirostris* (Valenciennes, 1842)

Common name: Blunt-snout barb ("Sia")

TL: 78 to 113 mm (N = 8)

Notes: The form of the anal fin is either truncate or emarginate (Ahmad et al., 2020). Their black, crescent-shaped scales contrast with their yellow fins. It can be found in the lowest depth of freshwater, surrounded by sand and stone (Ahmad et al., 2018).

Distribution: Peninsular Malaysia, Borneo, Sumatra and Southeast Asia. Ahmad et al. (2018)

Species utilisation: Subsistence food fish

5. *Neolissochilus soroides* (Duncker, 1904)

Common name: Brook carp ("Tengas")

TL: 85 to 145 mm (N = 10)

Notes: Previously known as *Tor soro* and *Barbus soroides* (Khaironizam et al., 2015). Elongated body, rounded abdomen, and concave-shaped dorsal fin. The lower jaw is sharp in edges, which is used to sweep rocks during feeding (Ahmad et al., 2018). Large scales (Rainboth, 1996), the dorsal fin does not have jagged edges like the genus *Mystacoleucus*. Absence of fleshy lobe on the lower lips and the growth of horny sheath on the lower jaw and snout that are blunt, broad and long (Khaironizam et al., 2015). It inhabits fast-moving water and spaces that are abundant in boulders since they prefer low temperatures (Ahmad et al., 2018).

Distribution: Southeast Asia, including Peninsular Malaysia, Thailand, and Cambodia. Froese and Pauly (2021b).

Species utilisation: Food fish.

6. *Osteochilus vittatus* (Valenciennes, 1842)

Common name: Bonylip barb ("Terbul")

TL: 60 to 98 mm (N = 14)

Notes: The body is elongated and compressed, and the mouth is protrusible, pointing upwards, and rimmed by papillae. A black mark may be seen on the peduncle of the caudal lobe.

Distribution: Mekong and Chao Phraya basins, Malay Peninsula, Sumatra, Java, and Borneo. Kottelat and Whitten (1996) p. 40.

Species utilisation: Food and aquarium fish.

Family: Eleotridae

7. *Oxyleotris marmorata* (Bleeker,1852)

Common name: Marble goby **(“**Ketutu”, “Ubi”, “Belontok”)
TL: 80 to 225 mm (N = 5)
Notes: The ground colour of the head and body; is light greyish brown with some large blackish-brown markings. Habitat in freshwater, brackish water with a pH ranging from 6.5 to 7.5, such as in a river, swamp and dam (Froese & Pauly, 2021c). Potamodromous; spawns in areas with lush plants or smooth stems, while during juvenile, it stays in shallow areas (Herawati et al., 2017).
Distribution: Mekong, Peninsular Malaysia, Philippines and Indonesia are bred for aquaculture purposes (Froese & Pauly, 2021c).
Species utilisation: Food and aquarium fish

Family: Mastacembelidae

8. *Mastacembelus armatus* (Lacepède, 1800)

Common name: Zig-zag eel, tire-track eel ("Tilan trek tayar")
TL: 185 to 380 mm (N = 4)
Notes: Previously known as *Macrognathus armatus.* Brownish-dark colour; pectoral fins are spotted, and anal and dorsal fins are spotted or banded (Gupta & Banerjee, 2016). Sex can be distinguished during spawning season, where males are brighter and more active than females. Habitats range from freshwater to brackish water with pH ranging from 6.5 to 7.5 (Froese & Pauly, 2021d). Mature fish can be found inhabiting rivers and wetlands at the bottom depth with sand, pebbles or rocks used to bury themselves partially (Fernado et al., 2019).
Distribution: Native to Malaysia and can also be found in Pakistan, Vietnam and Indonesia (Froese & Pauly, 2021d).
Species utilisation: Food and aquarium fish

Family: Nandidae

9. *Pristolepis grootii* (Bleeker,1851)

Common name: Indonesian leaffish **(“**Patung”, “Kepar”)
TL: 68 mm (N = 1)
Notes: The body is laterally compressed and brown; the distinguishable presence of six black vertical bars. It has a small mouth and upper jaw extending to the upper edge of the eye (Rainboth, 1996). Two flat spines are present at the opercle. Potamodromous (Ng & Abraham, 2019) prefers a tropical habitat characterised by slow or stationary

water with moderate to large sizes rivers (Froese & Pauly, 2021e). It can be found in shrubby plants since its dietary habits consist of algae, submerged plants, insects and crustaceans.

Distribution: Natives to only Southeast Asia, such as the Mekong basins, Peninsular Malaysia, Sumatra and Borneo (Froese & Pauly, 2021e).

Species utilisation: Food and aquarium fish.

The abundance of *Osteochilus waandersii* can also be observed in Sungai Keniam, which has recorded the second dominance (16.3%) after *M. marginatus* (18.7%), while in Sungai Madek, Johor, *O. waandersii* is also the second highest dominance (13.32%) after *Crossocheilus oblongus* (33.62%) (Chow et al., 2016; Mohd-Azham & Singh, 2019). In other studies, this species found in Sungai Pelus has recorded a total number of individuals of less than five, indicating that the species is common but rarely found in abundance (Ikhwanuddin et al., 2017). The same pattern can also be found in Sungai Ara, Sungai Jelai and Sungai Merah, located in Perak (Mohammad et al., 2018). This is further supported by a study in Bukit Merah where *O. waandersii* was present in one of nine sampling stations (Shafiq et al., 2014). However, one factor that is constant throughout the presence of *O. waandersii* is that the river substrates consist of sands and gravels with vegetation that provides shade, while fast-flowing waters influence the abundance.

All species sampled from Sungai Rengai are listed under Least Concern (LC), except for *Anguilla bicolor,* which is Near Threatened (NT). The status of *A. bicolor* was changed in 2010 due to exploitation in aquaculture, where the species was highly demanded (Jacoby et al., 2015; Pike et al., 2020). In addition, the eel is also threatened by climate change, habitat loss and anthropogenic activities such as mining (Gollock et al., 2018). In Malaysia, the species is also exposed to heavy metals. Although heavy metal pollution could be lower than the required standard, it could still affect this species' metabolism and cause death (Gollock et al., 2018). Other than that, the presence of dams and irrigation in rivers affected the migration of this diadromous species in Sungai Kurau, Bukit Merah (Jacoby et al., 2015; Pike et al., 2020). Thus, the population of *A. bicolor* will decrease since this species only migrate to breed once in its lifetime.

Sustainable management of fish resources can be achieved through a detailed understanding of the effects of climate change and anthropogenic activities towards *A. bicolor,* as well as other species. In Malaysia, one of the most common steps towards conserving fish species is aquaculture (fish breeding), which is led by the Department of Fisheries (DOF). However, species with the status of Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) have more priority over other status for conservation purposes.

CONCLUSION

Osteochilus vittatus was found to be dominant in Sungai Rengai, and its presence is common in Peninsular Malaysia. All of the fish species found in Sungai Rengai were listed by IUCN as Least Concern (LC), except for *Anguilla bicolor,* which is Near Threatened (NT) due to anthropogenic activities such as exploitation in aquaculture, mining activities and climate change. More intensive studies should be done to understand further the diversity of fish in

Sungai Rengai, including comprehensive research on biotic and abiotic factors affecting the fish distribution, such as water quality, allometric growth pattern and water velocity.

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AUTHOR CONTRIBUTIONS

Syed Danial Syed Abu Bakar: Conceptualisation, methodology, formal analysis and investigation, writing original draft preparation; **Farah Ayuni Farinordin**: Writing original draft preparation, conceptualisation, review writing and editing, resources; **Nur Amalina Mohd Izam**: Formal analysis and investigation ; **Nor Azliza Ismail**: Formal analysis and investigation ; **Mohamad Kamaruddin Zainul Abidin**: Formal analysis and investigation; **Shazana Sharir**: Formal analysis and investigation; **Nor Bazilah Razali**: Formal analysis and investigation; **Azhari Mohamed**: Formal analysis and investigation; **Nurfatin Zulkipli**: Formal analysis and investigation.

COMPETING INTEREST

The authors declare that there are no competing interests.

COMPLIANCE WITH ETHICAL STANDARDS

All fish handling procedures followed the Pahang Fisheries Management Act 1991. The fish samples were properly handled and were released upon identification to minimise fish injuries. This study also was conducted to comply with the EIA regulations approved by the Malaysian Department of Environment.

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